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Rolling apparatus for roller skates IAP20 Rec'd PCT/PTO 23 DEC 2005

The present invention consists of a device improving in many ways the use and the possibilities of roller skates, according to the use which is currently made. It is thus intended to be used only in association with roller skates. It notably aims at solving mostly problems of balance, to very appreciably reduce risk of falls, which concerns novice skaters particularly.

Its purpose is also and especially to significantly improve performances, notably in speed and stamina matter, which notably interests experienced skaters.

Its also aims at making safe roller skate practice, notably by offering a higher braking than traditional cycle one, as bicycle for example, and by giving to the skater other safety units, which interests all skaters categories..

It also aims at resolving the other problems relative to roller-skating, such learning and portage, which interests not only all the skaters, but also who is not skater yet but can easily and carefully become it.

At last, it enables to increase the employment opportunities where the roller skate is little used, notably in the matter of traffic on the public highway, of conveyance and of objects or loads carrying.

In the former art, we find the American patent US 5.938.240 describing a telescopic stalk equipped with a single roulette at an extremity, and at the other one of means enabling to solidarize with the skater's arm while his hand seizes an intermediate handle equipped with a handbrake control lever acting on the roulette to block it.

It rigidly prolongs the arm of the skater to enable him to take support to the ground. In fact, it is a crutch which extremity is equipped with a roulette avoiding a rough contact with the ground, enabling the novice skater to restore his balance by resting if necessary on the roulette which he can block by means of the brake controlled by his hand. But that is worth in a rule for imbalances forwards only, and certain lateral.

By skating very slowly, the skater can take support on the ground by making the roulette roll, but as soon as he takes a little balance and speed, he has to lift up the device, at least not being unbalanced if the roulette of very low diameter stumbles in anfractuosities.

To function, the blocking of the roulette with the brake is essential, hence the obligatory presence of a braking device. The skater can thus rest the time he wishes on this crutch, which acts as strut because of its solidarisation with the skater's arm.

Its use is exclusively reserved for skater initiation, because it cannot be imagined to use this device to slow down being launched in a descent to 50 km/h for example. Due to its out of centre position compared to the skater and his trajectory, the slightest contact of the roulette against the ground at a steady speed entails an imbalance of the skater by making him swivel.

Moreover, he is completely unbalanced when he wants to dash by skating, each of his arms having a different behaviour, one being free, and the other loaded with this device. Its use is thus very restricted.

The principle of the present invention is completely different, and uses other techniques.

Foremost, it uses a wheel of a definitely higher diameter and not a simple roulette, because the wheel requires satisfying the required purposes an unquestionable inertia and a strong adherence which is deprived a stiff roulette with a weak diameter and weight.

This wheel is intended to constantly roll in front of the skater, in the axis of its trajectory, and to keep a permanent contact with the ground. It is held and controlled by the skater in front of him by means of both his hands via the handles or a handlebar, located at the other extremity of the device, not one alone in the middle of the arm.

Both handles have no vocation, as it is always the case on the cycles of two wheels at least, the unicycles being deprived, to ensure the rotation of the wheel to control the direction and to offer a resistant support to hands and arms.

The hands do not rest on the handlebar but support it on the contrary, and the direction function is only secondary because this one can be obtained with the legs. The handles are essentially useful for balance, by maintaining the arms in a good equilibrium position and to avoid them uncontrolled movements causing imbalances or worsening them, and for assistance for the propulsion by tractions of the arms.

These two essential functions of the handles are found neither in the use of an at least two wheels cycle, nor in that of the device described in the American patent.

It is also important to see that the connection of the device to the skater is free and articulated, which leaves him maximum of freedom and ease, conferring him much manoeuvrability, unlike the American patent demanding to function no articulation between the elbow and the roulette, and a perfect solidarity of the device with the skater's forearm.

Contrary to this patent, it is not possible with the device to rest on the wheel even one fraction of a second without blocking it with the brake. It does not act like a crutch or a strut, but like a wheel of inertia, a speed reducer of brusque movements and accelerations, a pendulum.

So that the American invention can work its function, it is necessary the skater has the reflex to rest above, at the right time and in the good place to restore his balance. Moreover, his action is not educational, because the skater does not learn any lesson from the correction of an imbalance stopped by a support against a support will lack him if he is deprived of it in the future.

The principle of balance with the device of the present application comes from the defusing of imbalances and not only from hindering falls. An imbalance on roller skates can be directed forwards, backwards, laterally, or by rotation of the shoulders.

To and fro imbalances are due to an excessive support respectively on front or back wheels, due to a displacement of the gravity centre beyond the zone of support determined by the extreme roulettes. It follows a violent acceleration which beginner does not master, missing of necessary time to do it due to his inexperience. So he falls before having time to restore the position of his gravity centre.

Moreover, imbalance is mostly provoked or amplified by a bad position of the arms which moves the gravity centre in a point located outside the zone of extreme roulettes support.

Both symmetrical handles of the French device have at first as function to position the hands and consequently the skater's arms in a symmetrical and balanced way at a desirable height for a good position of the gravity centre, and to maintain this position even in case of imbalance, not to amplify it by an inappropriate, uncontrolled, even inopportune displacement of the arms which play a major part in the gravity centre position because of their important and very mobile weight.

On the contrary, the American patent imposes neither an adequate and symmetrical position of arms, nor does not prevent their inopportune movements, even for the arm fixed at the device, because the roulette is not intended to permanently roll on the ground and it can be easily lifted from the ground notably in a backwards imbalance movement. Besides the back imbalances against which it does not really bring solution, the American device does not seem to bring either solution to imbalances in rotation or certain side imbalances. It presents a limited interest and only for imbalances forwards.

With the present invention, from the revelation of an imbalance as well forwards than backwards, the inertia of

the wheel permanently put on the ground, obtained by its weight and/or its dimensions, and/or the distribution of its weight, or also the load it supports, is immediately opposed to the sudden above acceleration which is then slowed down, thus offering to the skater's brain a supplementary fraction of a second to correct himself the imbalance, helped for that by a certain constancy in the arrangement of the body's weights, the arms staying in a nearly identical position due to the handles.

Here is summarized the way the device, even deprived of any braking system, reacts against:

On the one hand imbalances to and fro:

- caused by the inopportune and sometimes uncontrolled movements of the skater's arms, by synchronizing them, by maintaining ahead skater's both hands, appreciably on the same plan and at a height of the ground determined by the length of the connection arm, and by absorbing their swinging, due to the alternate step of the skater, with inertia of the device and the wheel, and also with the gyroscopic effect of the wheel rotation, added to that which skater's arms opposed mutually:
- caused by an excess of support on the front or back roulettes, by defusing imbalance from its birth by the wheel inertia opposed to the brusque acceleration generated by incipient imbalance,
- and caused by an excessive slope of the skater's trunk forwards or backwards, by placing, his bust in ideal position by the adjustment of the height of the hands, and by limiting his movements in all directions by opposing the device and wheel inertia.

and on the other hand side imbalances:

- caused by a brusque rotation of the skater on himself, by opposing it at the same time the inertia of the device and the resistance of the wheel against a side skid,
- and caused by an excess of slope of the skater during turns with a weak radius, that by offering, after having quickly tilted the wheel to laterally deport it in the side of the turn, which slows down it until to stop it, on one hand a mobile support with the ground forming at the same time a restraint and a mark with the slope of the skater, and on the other hand a pivot point constituted by the immobilized wheel around of which the skater turns, keeping a rather constant radius and his forearms in ideal position,

the whole releasing the skater of his tensions and falls apprehension, which improves his style and pleasure.

It is necessary to remark that the beneficial intervention of the wheel is immediate and independent from any reflex of the skater, which is not the case of the American patent where the skater must find the time and the reflex to put the roulette on the ground, if it is not already there, to block it and to rest on it.

The inertia of the wheel acts in fact in the longitudinal axis like makes it laterally the pendulum of a funambulist. Moreover, imbalance being entirely managed and being restored by the skater's brain, without having to use a stiff support as in the American patent, the method of restoring is memorized for the future, and quickly the reflex times decrease. So that soon, having acquired the good gestures and reflexes without having to undergo falls, the skater becomes able to effectively master same imbalances without the help of the device, like an experienced skater makes it usually.

For side and in rotation imbalances, the wheel opposes its resistance against the side skid because it is connected to the skater by both his arms, which opposes so to an involuntary shoulders rotation.

If the American patent describes a device intended only for beginners, it is different about the present invention intended for of all levels skaters. To the beginners, it brings balance, the learning of the good position and the good reflexes. To experienced skaters it offers means of improving their performances, notably by speed increasing, stability in high speed, and reduction of tiredness resulting from a more rational and effective

propulsion and offering a higher range.
The diameter and the tread of the wheel of the invention, much higher than the one of the roulette of the American patent, are determining to give necessary inertia and adherence as well as to bring the good easy rolling necessary to the improvement of performances, the device not being reduced to simple and only learning of roller skate practice.
We also find in former art a German patent application OF 10043857 describing a device intended for roller skate practice, but searching a different purpose.
Its interest notably is not either to improve the propulsion or the speed of the skater, but to enable him to roll in sitting position on a seat fixed on an arm comprising a wheel held by a fork at an extremity, and at the other one a handlebar equipped with two coaxial handles, one of it being equipped with a control lever commanding a brake located on the wheel. Two curved plaques solidary with the arm enable a support on the skater's thighs when he takes place on the seat.
This position does enable to propel with the legs. The device can thus be used in the descents only.
Its interest seems to be rather limited, more especially without possibility to propel, and the reached speed cannot be its interest because it cannot exceed that of a traditional skater..
Figure 2 of this patent shows in three stages the way to take seat on the device. At the first stage, the device is placed in front of the skater like the device of the present patent application is usually, but not for the same reason, neither the same use, nor the same results because the German device is essentially intended to function under and between the skater's legs, the wheel being behind him.
We do not find in the description and the drawings of this patent more than in the quoted American patent the characteristics and the functionalities of the present invention. Notably, the German device, which moreover proceeded by the patent US4386794, requires neither adherence nor inertia to achieve its required purpose. Neither one nor the other is besides described in the quoted patents. Even placed in front of the skater to serve him as a simple support, it does not need any inertia or any adherence for that. The device does not comprise besides means to increase the inertia and the adherence of the wheel when it is used in front of the skater. On the contrary, on the drawing n° 1 the wheel appears with a hub of a big diameter, fine and less numerous spokes and a fine rim. Not only its weight does not seem important, but it seems rather concentrated towards the hub, which contributes to a weak moment of inertia. Also, the elements which compose it up (seat, handlebar with double handles, thighs supports) are arranged far enough from the balance of the wheel axis, so that the weight of the lower third of this device is relatively weak compared to its total weight.
Moreover, if it fits to the searched purpose, the arrangement strictly coaxial of handles directed perpendicularly to the arm, which has not any other purpose than to serve as support for the hands or to direct the wheel when it is in the front of the skater, is not adapted to obtain the objectives reached by the present application. This arrangement is not ergonomic to make the movements of the hands, of the wrists and of the arms which use of this invention requires, and would hinder the effectiveness of these movements while causing an embarrassment and an excessive tiredness to the skater. Besides, that it is placed ahead or behind the skater, the described device neither has as function to propel the skater, nor means are described to make it.
During the normal use, the handles do not any more enable to control the orientation of the wheel, the direction being ensured as described in the patent by the roller skates, the handlebar not being any more than a simple support for the hands.
At last, the position of the wheel in front of the skater is not adapted, because most of the weight of the device is

supported by the skater's arms, which quickly causes him an useless and uncomfortable tiredness going against the searched objective if is to make him secure.

At last, we find a patent WO 00/44607 describing a device equipped with a handlebar, a connection arm, two wheels located one behind the other, of an electric motor and batteries to tow a skater, without having to spend any muscular energy to move. First of all, this device is equipped with two wheels and two successive, parallel and not coaxial axis, while the present invention only requires at least one single wheel and a single axis to work. Secondly, this device is unusable without engine or without electric power and it cannot satisfy the objectives of the present invention.

It appears as a rolling device for roller skates users, intended to be used in association with roller skates, notably "quad" type with pairs of parallel wheels or "in line" type with aligned wheels. In situation of normal use, it is of the same type of device comprising, in situation of normal use, at high and back extremity two handles directed appreciably in a transversal way regarding the longitudinal axis of the device, intended each one to be held simultaneously and freely in front of the skater by each hand approximately as the height of hips when the arms are folded, the palm of hands being preferably turned towards the ground, without stiffness nor constraint regarding the skater, to control directly, notably by displacement or change of orientation or height of its longitudinal axis, the orientation and/or the rotation and/or the swivelling of at least one connection arm prolonging these handles and of a wheel axis, connection arm definitely tilted backwards towards the skater, which lower extremity is directly solidarized, or via at least one fork comprising at least one arm, with an axis directed appreciably in a transversal way regarding to the connection arm and supporting at least one wheel of at least 14 cm diameter to which are associated means of braking, this device being intended to roll in the axis of the trajectory of the skater and enabling this last one to take support on the ground and to limit his imbalances. The handles are able to directly orient the connection arm in all directions, including simultaneously in rotation and in swivelling.

It comprises, in order to present in normal and usual use the wheel maintained on the ground in front of the skater by means of the handles at several dozens of centimetres in front of the roller skates while completely keeping the control of the orientation of the connection arm and of the wheel by means of the aforementioned handles, means able to procure an increased inertia to the wheel and/or to the device and an increased adherence of the wheel with the ground, to develop a resistance on the one hand to a side skid notably during the propulsion of the legs and on the other hand against a wheel blocking during the braking, to enable respectively

- to appreciably limit the natural rotation of the shoulders of the skater during the movement of propulsion with the legs, known as "step of skater", by opposing the wheel resistance to a side skid to which subjects it the couple applied on the handles in the axial plan of the connection arm by the natural movement of rotation of shoulders, which so gets a mobile support relatively resistant to the skater's arms conferring at the same time a noticeable improvement of its balance and of the effectiveness of the propulsion of his legs by means of the skates resulting in an increased travel rate,

- to increase the travel rate of the skater by the traction of his body by means of his upper limbs, during movements of more or less big amplitude before back of the arms or of rotation of the wrists using mainly the inertia of the device and/or of the wheel, or possibly of pumping movements of the arms simultaneously using the inertia of the device and/or of the wheel and the adherence of the wheel, or still possibly of a movement of scull using the adherence and the inertia of the wheel,

– and to prevent during the braking the blocking of the wheel which would cause a skid making lose the

effectiveness of braking and the control of the direction, notably if the braking is strong.

The adherence and the inertia are preferably increased without increasing the weight supported by the skater

Preferably, the device is moved exclusively directly or indirectly by energy coming from the muscular force of the skater, even if this energy has been stored.

According to a preferential realization mode, the wheel axis and the wheel are single to obtain a lesser weight and a better manoeuvrability. But it is realizable notably with two wheels, located side by side, close or spaced on the same or coaxial axis considered as the same axis. The single axis or the axis are appreciably directed perpendicularly to the connection arm.

The means enabling to improve the wheel adherence are constituted for example by the use of a tire, a tread consisted of clutching material such as rubber and/or appreciably smooth and/or comprising lined sculptures and/or relatively wide, by sandpapering or brushing of the surface of the tread, by increasing of the pressure of one or several wheels on the ground, for example by making them support at least one additional load adding to the very weight of the device, arranged on the device near its wheel and more particularly near its axis, or resulting from a pressure of the air.

In an advantageous version, these various means can be cumulatively used to obtain the best possible adherence.

Preferably, the diameter of the wheel is included between 20 and 45 cm and that of the tread which profile is preferentially round is included between 3 and 5 cm to offer a good adherence, not to block in the narrow opening and asperities of the road and to present an unquestionable inertia. But relatively satisfactory results, even if they are partial, can be obtained without respecting these characteristics.

The hub of the wheel through which the wheel axis passes can be connected to the rim notably by spokes, bars or sticks, or a full disc.

To use the device, the skater holds it in front of him controlling the trajectory and the slope of the wheel freely rolling at contact with the ground in the axis of his trajectory to about 60 to 120 cm in front of his skates (according to the skater's size), each hand holding each handle. The handles are generally held at level of the hips or the pubis. The hands firmly enclose the handles, but without tension and with some flexibility of the wrists. The arms are folded and held close to the body, the elbows not deviating from it like that is the case about a bicycle handlebar, so that its bulkiness is reduced at minimum.

In position of usual operation, the device is directed so that the angle formed with the ground by a line passing at the same time by the wheel axis and by the axis of the handles has a value of 43 ° (+ or - 10 °) approximately. This angle and its tolerance determine a range of slope of the device where it globally gives the best results in various functions. But results which can be lesser, more partial or incomplete are however obtained beyond or below these values. They are not thus absolute, insomuch as they vary according to parameters influencing the wheel adherence such as the state and the nature of the ground, the rate of humidity of its surface and the load supported by the wheel axis. Moreover, during the use, the skater has frequently to modify this angle for short durations, but in a big way.

The device cannot be confused with unicycle of which it has not either the saddle or the pedals, whereas it comprises two connected handles and/or a handlebar, which is not the case of unicycle. Besides, the arm connecting the handlebar with the fork is definitely longer and less stiff than on unicycle, not having to undergo the same loads, efforts and constraints. Moreover, its use is very different, the user not taking place above the device.

To have the maximum of efficiency to the pressure of the wheel on the ground, additional load must be arranged the closest as possible of the aplomb of the wheel axis so that its weight offers the maximum pressure to the wheel on the ground.

Used so, the device undergoes important efforts, notably in twisting, at level of the handlebar, of the fork, and especially of the connection arm. He must be very solid and resistant, notably in twisting, insomuch as it is difficult to propose the connection arm in a single part only.

According to a preferential realization mode, the connection arm comprises means of boltable folding, such as telescopic and/or articulated elements, so as on the one hand to reduce the bulkiness of the device when it is not used and on the other hand to adjust the length of the aforementioned connection arm according to the size of the skater and in the fact that involving the fork, the connection arm, and the handlebar, two of these elements at least are separable and assembled together by boltable and unboltable means (99, 100, 101) of embedded positive connection offering no degree of freedom in locked position during the use of the device in normal operation, notably in rotation according to the connection axis .

This result can be obtained notably by a not circular section used to the connections of these elements together, in particular an elliptic or oval section, water drop shape or comprising at least one angle or an irregular curve to oppose to any rotation, or ergots and slits, keys and notches, pins, screws or complementary openings and cooperating between them.

A simple tightening of elements between them cannot be sufficient, even powerful as that is the case on a bicycle where the movements of the handlebar are normally transmitted to the wheel because its direction is free and the wheel do not undergo lateral constraints. When it is subjected by a lateral constraint, by blocking it between the feet for example, we notice that we can then turn the handlebar without this movement is transmitted to the wheel, the level of effort giving a degree of freedom not being very high in this type of connection.

The more the wheel is located forwards the skater, the more effective is the braking for the same effort. However, the more the wheel is remote from the skater, the more it loses its adherence. And also the more the skater's arms support the weight of the device. To obtain the most effective possible braking, it is advisable to increase the wheel adherence by making it support at least one additional load, and to increase the braking power, this load could not be more effective with equal weight than using a second braking organ, even if its weight seems limited, it is very significant in matter of adherence improvement.

Insomuch as the outside diameter of the wheel offering good performances without too much bulkiness for a device intended for an adult is located between 35 and 45 cm. About a model intended for a child, the successful diameter is located between 25 and 35 cm. On such diameters, a common brake of cycle wheel with friction pads is definitely less effective, with identical effort, than on a bigger diameter wheel usually set up on adult cycles.

That is why in a preferential realization of the invention, the means of braking comprise at least two systems of active braking acting each one on at least one common or different wheel, controlled jointly or distinctly by means such as at least one control lever located on one handle, so as to increase appreciably the power and the progressiveness of the braking while ensuring a safety in case of failure of one of them.

These braking systems can be activated alternately, or simultaneously, or alternately then simultaneously or the opposite.

This double braking system has not only for objective or effect to load the wheel axis, but also to reassure the skater and the device in case of failure of a braking system, to increase the power of the braking, to offer a progressiveness and/or a different power for each of the braking systems, to offer a bigger progressiveness by an

alternative then simultaneous use, to shorten the response time when devices are subjected to the harmful action of the rain, to facilitate the use of the controls both for the right-handers and for the left-handers, and to enable an accordance of the device with the French Traffic rules imposing to the cycles by its R315-3 article, among which the skater using the device is, to be equipped with two effective braking systems.

In a preferential way, both braking systems are the same type and are arranged either on both side arms of the fork, or according to different radius lengths on the wheel rim, so as to obtain by this simple arrangement a different action and progressiveness one compared to the other.

In an advantageous way also, the braking organ located in front of the fork is arranged close to it, whereas that arranged behind can be distant of it, its position dependent on the friction pads length, so as the to and fro pads do not hit not to interfere nor to bother. This particular arrangement notably has the advantage to free space above the wheel to arrange more important loads there. Preferentially also, and to the same purpose, the front brake is arranged as low as possible, whereas the brake behind the fork is arranged as high as possible. This arrangement also enables to obtain a different progressiveness on both brakes, the arm of lever which they apply on the friction pads having a different length and thus a different effect.

To improve the wheel adherence during the braking by opposing to its separation of the ground by absorption of rebounds caused by the harshness of the ground, means are interposed in at least one zone located between handles and wheel axis, these means enabling to reduce by elastic progressive compression the distance between these two parts of the device during the stages of braking counter means of elastic recall, constituted for example by a connection arm which structure enables a cambering operated in the stage of elastic deformation of the material constituting it, or by interposed shock absorbing elements.

Such shock absorbing elements only aim at the improvement of the adherence and can not cause improving of comfort of the users as that is the case about other vehicles.

If the handles are arranged directed in a plan appreciably parallel with the trajectory or transverse with the wheel axis, their free extremity must be downwards tilted to fit for the hand and wrist ergonomics. But during the use of the device, the skater frequently varies the height of the handles, during a short time certainly, but with one rather big variation of amplitude. So that this arrangement of handles is not adapted and is very uncomfortable, because it requires an important downwards slope variation according to the height where the handles are held. We thus prefer an arrangement where the handles are set up in a plan appreciably parallel to that of the wheel axis, transverse with the axis of the trajectory in what it offers more tolerance to hold them at various heights, without major constraints of ergonomics for hands, arms and wrists. It also enables and especially to better control the slope of the wheel and to apply with an increased strength a couple of forces on the handles to obtain an assistance to go forward. Preferably, to improve comfort and ergonomics, every handle is set up on the device according to an orientation appreciably identical to that of the axis of a piece of tube held freely and enclosed by the corresponding hand while it is forward as high as the pubis and the hips in approximately 10-15 cm of the body, the non-folded wrist being in the natural continuation of the forearm, the arms being folded and the elbows maintained laterally near the body, the device being in operation position directed so that the angle formed with the ground by a line passing at the wheel axis and by the axis of the handles has a value of 43 ° (+ or - 10 °) approximately. This angle and its tolerance determine a range of slope of the device where it gives globally the best results in various functions. But results which can be lesser, more partial or incomplete are however obtained beyond or below these values. They are not thus absolute, insomuch as they vary according to parameters influencing the wheel adherence such as the state and the nature of the ground, the rate of humidity

of its surface and the load supported by the wheel axis. Thus the free extremity of the handles is directed backwards and downwards.

According to this arrangement, during the use of the device, the elbows stay close to the body in compact natural position, and the holding of the handle is ergonomic for the hand which encloses it, so that this last one applies all around a regular support without undergoing more important and uncomfortable pressure notably concerning the base of the thumb, nor constraining the elbows to deviate from the body.

The orientation of the handles of a bicycle handlebar is different, because the position of the sat and oblique body forwards is not the same one, and the height of hands and the position of arms are also different, the elbows being often remote from the body to have more force to control the handlebar and also to pedal.

In a advantageous way, the handles are set up swivelling on their longitudinal axis according to at least one fraction of turn, in a free way or related with means of elastic recall, of friction, or of bolting, so as to enable the skater by swivelling and successive movements of wrists applied on the handles themselves to obtain impulses forwards to the device, which related with the effect of the very inertia to the device procure stages of acceleration by propulsion forwards produced in a different and additional way by the propulsion obtained by the movement of legs on the skates.

To increase the adherence of one or several wheels by increase of its pressure on the ground, the device comprises means enabling to arrange at least one load either ballasting, or to carry, which weight is largely supported by the wheel axis, for example near or on both sides the aplomb of the wheel axis, in a way appreciably balanced, these means being constituted for example of one load-carrier formed by a box, a rack or a grid, at least one hook, a ring or a thread or not opening constituting loads supports, or thread edges enabling to screw weights of ballasting (151) coaxial to the wheel at the extremities of its axis.

Firstly, we use a load having a utility or another function for the skater, besides its function of ballasting. It can so be constituted advantageously by an accessory, an equipment, effects or luggage to be carried for example.

Preferentially, the means enabling to receive at least one load near the aplomb of the wheel axis are set up on the device so as to arrange the gravity centre of the load in front of the aplomb of the wheel axis, preferably in a variable and adjustable way, so as to bring closer the gravity centre of the device to the aplomb of the wheel axis by making at least partially counterweight of elements located between the skater and the wheel axis, the connection arm and the handlebar notably, so that a part at least of the weight of these elements and the load be supported by the wheel axis to increase its adherence while relieving of it the skater's arms.

The gravity centre of the load can be so arranged more or less in front of the aplomb of the axis according to its weight and to that of the connection arm and handlebar.

In a preferential realization mode of the invention, the means enabling to make support an additional load to the wheel axis comprise means of amortization and/or absorption of shocks and vibrations caused either by the irregularities of the ground or by the forward to backward movements, so that the load undergoes them very attenuated only, such for example by using a material presenting a certain elasticity in the structure of the load-carrier, steel for example, and/or by at least one more or less pronounced curvature, and/or by a cantilevered position with regard to a point of solidarisation at the device obtained for example by a fixation procured by at most two opposite coaxial points of fixation each equipped with means opposing effectively to the rotation of load-carrier around these points of fixation, enabling to obtain during to and fro movements of arms (b) or by swivelling movements of wrists, an increase of the propulsion effect by an effect of expansion of the shock absorbing element related with the inertia of the load.

To amplify the effect of inertia of the device and increase so its propulsion effect, the means enabling to make support an additional load to the wheel axis comprise means enabling to make the load mobile according to the before back axis of movement of the device, freely according to the movements applied by the skater on the handles, such as for example the setting of the load on at least one slide or at least one articulated or elastic arm and preferably related with means of amortization at the front and back end of running.

The load can be constituted by the weight of carried objects or by the weight of ballasting. It moves forward to backward and conversely with every to and fro movement of arms, and according to the will of the skater, its effect at the end of back running can be weakened whereas the effect of inertia can be amplified at the end of front running, notably thanks to the effect expansion of elastic support arms. It so plays the part of an inertia engine.

The load can also be made mobile to and fro and conversely in an adjustable, controlled and boltable way to adjust the gravity centre of the load with regard to the wheel axis or distribute the weights on both sides of the wheel axis, either automatically by an appropriate device, or with the skater's will. These means can consist of an electric engine activated by means of control arranged close to one handle at least, entailing forwards or backwards by means of an endless screw for example, the load-carrier set up on slides. The load-carrier can also be set up on at least one boltable slide and to be manually moved forwards or backwards after unbolting.

These adjustable means of move, controllable and boltable notably enable to adjust the position of the gravity centre of the load regarding the axis of one or several wheels, to balance it on both sides or partially compensate by effect of counterweight for the weight of the connection arm and the handlebar, as well as for the various elements or for accessories which they support, so as to reduce the weight supported by the skater's arms at necessary minimum to ensure him an easy control of the load so balanced on one or several wheels, whatever its weight is.

To arrange the load appreciably with horizontal during the movement or at stop according to the size or the preferences of the skater, the device comprises means of adjustment of slope to and fro and conversely, either of load-carrier with regard to the connection arm, or the connection arm with regard to load-carrier.

Preferentially and so that the fixation of loads or accessories on load-carrier is simple and fast, it is equipped of means of vertical boltable retaining by a simple pressure on the load to solidarize it to the load-carrier, and unboltable by means of control to disunite the load, control lever for example, related with means of lateral and longitudinal retaining of the load.

These means consist for example of at least one hook or at least one mobile stalk around an axis or fixed, equipped with means of recall in bolting position, a spring for example, which swivelling is controlled by a means hand operated, a handle or a control lever for example, to unbolt it while placing it in waiting position by means to arm the bolting.

The load or the object to be fixed is, as for it, solidary with additional means, at least one stalk or at least one hook, respectively fixed or mobile intended to take place in the hook or to block the stalk of load-carrier, after a manual pressure makes it by acting on the means to arm the bolting which so release the hook or the stalk which retains captive the additional stalk or hook in bolting position by the action of the recall means.

The load or the object to be fixed is also equipped with means of lateral guide and with cooperating support with load-carrier on which they rest to ensure a lateral maintenance of the load.

The means of support of an additional load can also be constituted by a seat intended to receive a young child, and this seat and/or the device can comprise means enabling to fix it to the device in directed position either forwards or backwards the device.

Preferably, the device and/or the seat for child and/or the load-carrier comprise means of lateral stabilization coming into contact with the ground when the slope of the loaded wheel reaches a level difficult to control by means of handles, so as to oppose to the lateral overbalancing of the device when is loaded, these means of stabilization being equipped at contact with the ground of means of rolling or gliding to soften the contact with the ground when the device is rolling, for example a roulette swivelling set up to take every orientation, or directed so as to roll during its contact with the ground, or a deflector which higher part is curved as ski spatula to favour its gliding on the ground without risk to collide it.

The means of stabilization are preferentially equipped with means of adjustment in length, in height and/or in slope to determine their level of intervention, notably according to the nature and/or to the weight of the load, and the muscular force of the skater, and means of folding when they are not used, for example by swivelling towards the wheel, possibly with bolting and unbolting means.

The structure of the seat, in particular the lateral prolongations in which child's legs take place, can constitute these stabilizers or participate in their implementation.

In an interesting way for the comfort of the child, the seat, its support or the load-carrier is equipped with adjustable means enabling to vary its slope forwards or backwards.

To facilitate the arrangement on the device of loads or various objects, the load-carrier is constituted directly or not by a basket, by a rack or by a box comprising means of folding on itself to reduce its height, preferably quickly, so as to enable the arrangement of loads freely inside when it is in unfolded position, or outside by arranging and fixing them directly above when it is in folded up position, notably when their dimensions exceed its ones, the folded up position in case of non utilisation improving besides appreciably bulkiness and drag coefficient of the device.

Preferentially, this basket or rack is made of synthetic material and comprises means enabling to maintain squeezed together the folded up parts so that they do not collide while rolling. These means can consist of elastic hooks, preferably metallic to remain solid and discreet by a weak diameter. The hooked extremity of the control lever enabling to unbolt the means of vertical retaining of the load on the load-carrier can also play this part thanks to its elastic recall.

To reduce the risk of theft and loss of the carried objects, the rack or the basket can be equipped with a supple or stiff lid opening rather forwards to be activated when the device parks on its kickstands, or still of a rather slightly elastic and stretchable net to conform to the shape of objects when they jut out over the opening of the basket or the rack.

Even when it carries loads, the device cannot be confused or likened with a wheelbarrow. Notably, this one is intended to be used on foot, walking, not skating with roller skates. Contrary to the device, the wheelbarrow which is intended for a low speed use, by walking, is not equipped with braking system. Besides, it is pulled or pushed, but it has no vocation to be propelled, especially on flat ground or in ascent. Its handles are directed in the same axis as the trajectory and are tilted at rest horizontally or upwards in operation to be held by hands palm towards legs and tense arms laterally along legs, while those of the device are carried ahead with the folded arms, which supposes a different orientation and slope. Even when the wheelbarrow is empty, handles cannot be

held higher or ahead, the weight at their level being big because of the position of the gravity centre, whereas it is only about 0.5 to 2 kg with the device.

The device is also equipped with means of bolting or blocking of at least one braking organ in working position to immobilize the wheel during the parking, so as to be able to support it up or oblique against any support. These means of bolting or blocking are equipped with a means of elastic recall in rest position, for example a swivelling set up hook at the free extremity of one handle retaining a control lever of brake control pulled towards the handle in working position, equipped with a spring releasing the control lever from the hook as soon as it is again pulled enough so that the hook releases itself from it.

Preferentially, these means of bolting or blocking consist of a metal or plastic thread folded to the shape of brake control levers and forming a closed hook, which extremities are folded up the one towards the other one and are introduced into openings made in opposite at the extremity of at least one handle, equipped on one side with the joint of a spring which one branch support against an arm of the hook whereas the other one is introduced into a small opening made in the extremity of the handle.

So, by pulling the control lever to place at least one brake in working position, the hook can be overbalanced under the handle with the auricular until coming to position under the control lever, which can be then released by the hand to be retained by the hook.

To unbolt, it is enough to pull again the control lever sufficiently so that the hook releases itself by effect of the spring and takes again its rest position.

The device can be also parked in a more practical and fast way in any place, even deprived of any prop to support it.

For that purpose, the device comprises means enabling to park it in an appreciably vertical position keeping the wheel on the ground, for example at least one kickstand formed by a stalk or by a tube which one or several free extremities take support on the ground when the device is overbalanced forwards, by forming at least two support points with the ground arranged triangular with the contact point of the wheel with the ground, these kickstands being optionally connected together by means, such as a bar or a tube, enabling at the same time to stiffen them, to act as bumper, notably to protect the legs of a young child sat in a seat above the wheel, and to support at least one accessory of driving or safety such as a headlight or a front light.

This mode of parking is very quick and simple to implement without requiring the latter particular handling.

The means forming kickstand can also be located behind the wheel, fixed at the connection arm. But preferably, these means are arranged above and ahead the wheel. In an advantageous way, they prolong the means enabling to lay a load near the wheel, notably a load-carrier. Suchlike, they can benefit of effect of amortization of shocks which these means can be equipped.

The kickstand extremity touching the ground is equipped with a protection plug, made of synthetic or rubber material.

The device also comprises foldaway means enabling the skater sitting down above or resting on it when they are deployed, notably when the device is parked in an appreciably vertical position l, so as to rest.

Preferably, the device is easily disassembled, and the connection arm is telescopic, at the same time to be fitted to the size of the skater, and to reduce the bulkiness when the device is folded up or disassembled.

The transmission braking means connecting the handlebar with the wheel ensured by classic scabbards for example unmistakably constitute a hindrance and a bulkiness constraint during the disassembling, or when the connection arm is strongly shortened for a small size skater.

To resolve this inconvenience, the braking control is partially transmitted at least by transmission means of type supple and retractable enabling a reduction of their bulkiness during the "folding" of the device by shrinkage of the connection arm length, and/or an adjustment of their length according to that of the connection arm, and/or a adjustment of the length of the telescopic connection arm in a predefined length during its deployment, such as a resistant chain passing preferably inside the connection arm, which number of used links predetermines the length of the connection arm to be deployed.

To quickly fix an additional load to the device, or an accessory, the load is fixed at the device by means of at least one elastic deformable fixation preformed with the shape of the support and solidary with the load, introduced into the support by a manual pressure entailing its deformation followed by elastic recall appreciably to its origin shape after its inserting into the support, such as a clip enclosing a tube, that of the handlebar, the connection arm or the fork for example.

The device also comprises support means of additional loads, these means also ensuring at least another function such an appreciably rectangular element presenting two channels and comprising on its central external face a thread opening, whereas the opposite face, appreciably shaped to its support, is solidarized to the lower face of the connection arm by soldering for example, enabling to fix at least one accessory such a bottle-rack or tin-rack by means of the thread opening, to support and guide the transmission means of the braking control by passing them inside, and/or to oppose against the rotation of an elastic fixation clip of another accessory.

In a realization mode of the invention, the device comprises means such as fairing or deflector element, spoiler, fixed or folding up, having fixed or variable geometry, presenting a significant surface and an aerodynamic shape adapted to constrain the air sliding on their surface during the movement to apply an additional pressure on the wheel of the device adding to their very weight to increase its adherence, while improving the aerodynamic shape of the device and the skater.

To adapt it according to the skater's size, the means constraining the air to apply a pressure on the wheel of the device during the movement are equipped with means of adjustment in position enabling to adjust their height and/or their vertical and horizontal slope and/or their width, or their slope around the wheel axis, notably according to the skater's size and the angular orientation of the device.

So that it is practical to use, to arrange and to protect against theft, the device moreover comprises means enabling to hang it in an appreciably vertical position, either with any free support to park it or array it, for example a ring or a hook arranged in its longitudinal axis near handles or handlebar over its gravity centre in vertical position, or with an outside fixed element by introducing a padlock cable through a ring solidarized by soldering for example with the body of the device, or with an object such a supermarket carriage, notably at the top of its front face, for example an opened hook arranged preferentially about the middle of the connection arm and solidarized to this one over the gravity centre when the device is vertical position, so that it does not overbalance.

For aesthetic considerations, this hook can be made of transparent plastic, Plexiglas ® for example. Its opening is arranged on a parallel plan with that of the wheel so that it can come to support at the same time against the bottom of the carriage, the handlebar being perpendicular fore the carriage, but above this one, so that it does not hinder the hanging.

Not to be hindered in the urban traffic, the device moreover comprises means enabling it to easily jump over kerb without any shock, themselves constituting a means of ballasting suitable to increase the inertia and the adherence, for example constituted by a device of type skate comprising an rectangular, lengthened and

relatively narrow board, arranged longitudinally in the axis and fore the wheel of the device, sidelong regarding to the ground, which superior foremost extremity is preferentially bent back upward as ski spatula and fixed at the device by elastic or not means of connection, and which lower extremity is close to the wheel and located at a few centimetres from the ground.

By front approaching the kerb, the bottom of the jumping board comes into contact with the kerb, and the board slides on this angle until its lower extremity. When the wheel which follows comes into contact with the kerb, the angle is tangential and then the wheel can easily jump over it.

To weaken the contact of the board with the kerb angle, the device comprises means of amortization such as elastic and deformable fixations of the jumping board. This effect is preferentially obtained by fixing the extremity of the stiff fixation of the jumping board to the load-carrier equipped with means of elastic amortization.

However, such a device located ahead the wheel does not enable any more the parking by overbalancing of the device forwards, beyond the aplomb of the wheel axis, the jumping board coming then into contact with the ground.

To prevent this inconvenience, the device and/or the means enabling it to jump over easily and without shock kerb comprises means of declutching of the jumping device, notably to enable the parking of the device in an appreciably vertical position with the connection arm overbalanced ahead the aplomb of the wheel axis.

When using this device, the third resistant contact point with the ground is not any more constituted by the contact point of the wheel with the ground, but by the lower extremity of the jumping board, the wheel taking place over him.

According to a variant of realization of the invention, the braking means are constituted by means of recovery of energy from the wheel, themselves constituting a means of ballasting suitable to increase the inertia and the adherence, transforming the kinetic energy of the whole device - skater partially into mechanical, electric, electromagnetic energy, or pneumatic simultaneously stored inside means of stocking such as respectively a spring, a battery of electric accumulators or a tank of compressed air for example, together with means of releasing of the said energy, and so that the aforementioned braking organ is reversible and uses the energy when it is released to propel the wheel.

The searched purpose is not necessarily to store an important quantity of energy to make the device automobile and autonomous, but to constitute a temporary buffer enabling to help a little the skater in the following ascent by using the energy recovered during the last stop or slowing down, preferably than getting it lost.

If this brake reveals insufficient, because the means of stocking are saturated and/or because the braking requires more power, the skater can then activate a second brake at least controlled by a control lever located close to the other handle.

According to another variant of realization, the device besides comprises at least one propulsion organ of the wheel constituting itself a means of ballasting suitable to increase the inertia and the adherence, and by means of control intended to be activated by at least one skater's hand, constituted by autonomous motorized means for example located in the hub of the wheel, moved by a source of energy independent of type fuel in a tank, or of type electricity contained in a battery, the aforementioned means of stocking being arranged either near the wheel or in a way appreciably balanced regarding to the wheel axis aplomb so that the main part of their weight is supported by the wheel axis, for example against the outside or inside at least one of the fork arms, or preferably in an adjustable way to and fro ahead the aplomb of the wheel axis, for example between kickstands.

In a advantageous way, the braking organ transforming the energy and/or the propulsion organ of the wheel is located inside the wheel or inside the rim, in the hub for example, the means of energy stocking being or not arranged in an adjustable way ahead the aplomb of the wheel axis, so as notably to increase the pressure of the wheel on the ground and so its particularly necessary adherence in the mode of propulsion.

So that braking or propulsion is progressive, the device comprises means of clutch and/or variation of the transmission ratio between the wheel and the braking organ and/or the propulsion organ, such for example a swivelling pebble, coming to friction against the wheel or a solidary disc with this one, sliding on slide channels to make vary the length of the rotation radius of the wheel regarding to the pebble. In a preferential way, the disc unites the wheel axis with the rim, instead of the traditional spokes.

This variation can be obtained by a control lever located on the handlebar or the handle, applying a traction on a cable when it is drawn by the skater's hand towards the handle, having at first the effect to bring into contact up to a pre-adjustable abutment a pebble set up and solidary with the free extremity of the rotor of a reversible electric generator, according to a preset pressure by the position of the abutment, with a solidary disc of the wheel rim preferentially having a surface suitable for increasing friction coefficient, streak relief converging towards the wheel axis for example. The pebble is equipped with means to increase its friction coefficient such as a tread made of streaked or not and clutching material, rubber for example.

In a second time, the traction on the control lever moves linearly to a few centimetres along the connection arm or one of the fork arm, the body of the electric generator fixed at a mobile support in a fixed rail of guide solidary with the connection arm or one of the fork arm, according to the intensity of the traction applied on the control lever. This movement is made towards the outside edge of the disc while maintaining the axis of the pebble perpendicularly to this edge and directed to the wheel axis. So, the power of the braking is increased by reduction of the couple of the wheel by compensation of increase of the electromagnetic resistance of the electric generator, contributing to a bigger production of electric current and resulting from the acceleration of the rotation of the rotor. On the contrary in propulsion stage, the speed of rotation of the wheel decreases against an increase of the couple of the reversible generator. Their recall in rest position at the end of braking or of propulsion of the body of the generator towards the wheel axis on the one hand and the pebble close to the disc on the other hand, being ensured for each one by means of elastic recall, a spring for example.

To facilitate the disassembling of the device, the transmission device of the control to the braking organ, cable for example, is separated in two parts or fixed at the mobile control lever of the braking organ by a quick tie or divisible means enabling union and fast disunion of both parts, for example a male element with an elastically deformable ergot blocking itself behind retaining means, abutment for example, of a female element after having been introduced there, and unboltable by pinching of ergots the one towards the other one to release them from retaining means.

The device has vocation to be used on the road where it goes alongside other vehicles. For the skater's safety, it comprises at least one means of laterally stretchable visual signalling and intended to hold remotely other vehicles, such a fluorescent colour pennant located at the extremity of a telescopic element located for example inside a handle and deployed in the prolongation of this one.

The free extremity of the telescopic element is preferably metallic to dissuade the users not to respect the lawful safety distance, at risk to stripe their vehicle painting. The device can comprise besides at least one fixed safety organ laterally deported from the longitudinal axis of the device, directional and/or folding notably by rotation around the axis of its fixation with the device, equipped with a mirror to offer the skater a back vision without

turning round, a side-view mirror for example, solidary with at least another safety means conferring better spotting for the safety of the skater, such as a directed and visible fixed or twinkling red light backwards, a directed and visible fixed or twinkling white light forwards, a directed and visible twinkling orange-coloured light forwards and/or backwards, a visual signalling such as reflector, material reflecting the light, phosphorescent or fluorescent directed and visible forwards and/or backwards, this organ constituting itself a means of ballasting suitable to significantly increase the inertia and the adherence despite of a relatively weak weight.

The offset of the device is obtained by use of a stalk fixed by a joint with at least one of the fork arm, or the connection arm. Preferably, this stalk is articulated on its support so as to fold towards the device to weaken the shock in case of collision with a foreign body or when not used, to reduce the bulkiness. The conjunction of a function of visual safety with a side-view mirror is justified because both must be deported towards outside not to be masked by the skater's body, notably involving the red light which must be visible backwards. Preferably, it is set up on the traffic side if single.

Being intended to improve the possibilities of roller skates use, notably as completely autonomous conveyance, the device can be equipped with safety devices and driving help, in particular information means, signalling and visual and acoustic safety, together for other users and skater, being able to use the electrical energy recovered and stored during the braking, such as a lighting projector , a fixed or twinkling brilliant device, a surface calling someone's visual attention in fluorescent, phosphorescent, reflective, reflectorizing colour, a manual, electric, electro mechanic or electronic hooter, a making sound effects device using the wheel rotation to alert pedestrians about the speed movement, at least one preferably folding side-view mirror, a speedometer and kilometric meter communicating by waves with an information sensor located at the wheel.

Currently known speedometers for roller skates do not satisfy because the information display, often located on one roller skate, is not easily readable and accessible to the manipulations during the skating. Moreover, the procured information is not reliable because the wheels do not make exactly the same trajectory as the skater makes, because they are not in permanent contact with the ground and they roll obliquely regarding to the skater's trajectory. The meter basing its calculations on the rotation of the wheel, the device thus prevents these inconveniences and procures right information.

When it comprises two connection arms, it comprises means enabling to activate at least one braking organ, either by separate connection arms one from the other one, or bringing closer the one towards the other one. Besides it comprises means enabling to fix a launching level of this action, so as it prevents inconvenient due to the launchings movements of the legs propulsion or the arms propulsion.

The invention is going to be now described in several ways of realizations only given as samples, by means of the following drawings:

Figure 1 shows the device sideways according to the invention.

Figure 2 shows the joint principle of a fairing regarding to the wheel.

Figure 3 shows the front wheel of the device sideways with equipments.

Front figure 4 shows the handle extremity equipped with a hook to block the brake control lever.

Figure 5 shows sectional load support ensuring several functions.

Figure 6 sideways shows a hook to suspend the device to a supermarket carriage.

Figure 7 shows sectional hook of figure 6.

Figure 8 sideways shows the front wheel, the device being parked in an appreciably vertical position forwards.

Figure 9 shows a model of load-carrier prolonged by kickstands seen from top.

Figure 10 shows sectional solidarisation point of load-carrier of figure 9 on the extremity of the fork with the device.

Figure 11 sideways shows the solidarisation point of load-carrier of figure 9 on the extremity of the fork with the device.

Figure 12 shows sectional solidarisation point of load-carrier of figure 9 on the extremity of the fork with the device equipped with adjustment means of its slope.

Figure 13 sideways shows the solidarisation point of load-carrier of figure 9 on the extremity of the fork with the device equipped with adjustment means of its slope.

Figure 14 shows sectional load-carrier of figure 9 equipped with quick hanging means of the load, and connected means solidary with the to be fixed load.

Figure 15 shows the load-carrier of figure 9 seen from top and equipped with quick hanging means of the load.

Figure 16 shows sectional quick hanging device and connected means solidary with the to be fixed load.

Figures 17, 18 and 19 show in detail parts of figure 16.

Figure 20 shows a variant of realization of the invention front viewed and equipped with a brake and with means to realize figures and acrobatics.

Figure 21 shows a strengthened assemblage of the connection arm with a foldable handlebar.

Figure 22 schematically shows a child seat above the wheel equipped with means of lateral stabilization seen back.

Figure 23 sideways shows a variation of couple device of a reversible braking organ.

Figure 24 shows at the same time an assemblage the connection arm in the fork, and a section in water drop shape of the connection arm and fork head.

Figures 25 to 28 schematically show the help principle to advance of various movements seen from top.

Front figure 29 shows another arrangement of stabilizers.

Figure 30 sideways shows a mobile load set up on flexible arms.

Figure 31 sideways shows a mobile load hanged to flexible or articulated arms.

Front figure 32 shows in detail a stabilizer of figure 29 fixed at a fork arm.

Front figure 33 shows the mobile load of figures 30 and 31, and fixed ballasting weights.

Figure 34 sideways shows a mobile load set up on slides.

Figure 35 shows sectional according to the axis BB of figure 36 a variant of the invention equipped with two wheels.

Figure 36 shows sectional according to the axis AA of figure 35 the variant of the invention of figure 35.

On figure 1, the device presents a wheel 3 about 40 cm diameter consisted of an alloy rim 10 with three curved branches, and a tyre 3 equipped with a smooth tread 6 of rubber rolling on the ground 5 around an axis 4 of wheel 3 set up on ball bearing. The tread was paper sanded and brushed with a metal brush to increase its adherence. The wheel 3 set up on a fork 7 with two arms fixed at the lower tube of the connection arm 2 with a connection without any degree of freedom, corresponding to that illustrated on figure 24. The length of the fork 7 is 30 cm and the diameter of its arms is 22 mm. They are bent and soldered aluminium tubes, which free extremity is flattened and drilled to the diameter of the axis 4 of the wheel 3. The fork 7 arms comprise thread openings 153 made in circular parts 154 jutting out and soldered with the arm of the fork 7 enabling to fix it two braking systems 19 with friction pads acting on the rim 10 of type V-brake, and accessories (pump, bottle-rack,

side-view mirror, etc.). The assemblage of the lower tube of the connection arm 2 is maintained tightened by an inferior clamping band with eccentric 13 manually controlled by a control lever 12, of type those used to block height of bicycle saddles stalks. The fork 7, the connection arm 2 and the handlebar 8 notably are made of polished and treated against oxidation aluminium. The connection arm 2 is rectilinear and telescopic comprising two tubes which one slides exactly in the other one, with interposition of an intermediate tube in material facilitating the gliding of the tube of lower diameter in the other one, plastic for example. But for aesthetic considerations, it can present at least one curvature, this one hindering however the possibilities of telescopic function. The lower tube is 35 mm diameter and the superior tube 28 mm. The blocking of the length of the connection arm 2 is also ensured by a superior clamping band eccentric 11 manually controlled by a control lever 12. The lower tube comprises longitudinal slits 102 at each of its extremities about 3 mm width on a 35 mm length, so as to enable a deformation of the tube caused by the clamping bands 11 and 13, and to tighten the part inserted inside so that it remains captive there. The slits 102 are at least among two, but the deformation is easier and more regular if there are three equidistant slits 102, and the tightening of the part is better, although the break strength is lesser. Not to these slits 102 constitute an onset of break or tear of the tube, they are ended by a circular cut 103 increasing the opening in the point of embitterment of the tube caused by the slit 102. The clamping bands 11 and 13 are fixed at the lower tube by one screw. The superior clamping band 11 comprises an ergot which it is solidary, arranged axially on its internal face. Its length corresponds to the width of the clamping band 11, and its thickness to that of the slits 102 and to that identical of a longitudinal groove of which the superior tube of the connection arm 2 is equipped. The height of the ergot corresponds to the sum of the thickness of the lower tube and the depth of the groove, to which adds the thickness of the intermediate element for the gliding interposed between both. So, when the clamping band 11 is tightened, the ergot takes place at the same time in the slit 102 and in the groove of the superior tube, and prevents any rotation of the superior tube regarding to the lower tube, even when the clamping band 11 is released, enabling then a free longitudinal movement to adjust the length of the connection arm 2. The sliding extremity of the superior tube comprises from 2 cm of its extremity and in the alignment of the groove an automatic pin 17 of 8 mm diameter coming to take place in one of several aligned corresponding openings made at regular intervals or not in the lower tube. When the automatic pin 17 takes place in an opening, pushed by a spring located inside the tube, tubes are longitudinally, even without tightening of the clamping band 11. To release them, it is necessary to press on the automatic pin 17 with a finger so that it escapes the opening where it is. This automatic pin 17 enables at the same time to retain the superior tube so that it does not go out completely of the lower tube when it arrives at the running end, to locate the length adjustment of the connection arm 2, and to reassure in case of adventitious releasing of the superior clamping band 11 during a braking for example, the unexpected and dangerous folding of the connection arm 2 which can stop by the auto-blocking of the pin 17. The total length of the lower tube is 55 cm and that of the superior tube 52 cm. The superior tube is solidarized by soldering with a foldable handlebar 8 consisted of two handles 1 connected together by a split tube 94 which lock controlled by a control lever with eccentric 91 tightens and maintains an extremity of both handles 1. In this extremity, as shown in figure 21, this one comprises an automatic pin 92 coming to take place into an opening made in the tube 94 of connection to ensure their alignment before their blocking. The tube 94 of connection is soldered with the high extremity of the superior tube of the connection arm 2. Because of the efforts and the constraints caused by the forces couples applied on handles to obtain an assistance to go forward, the handlebar 8 must have a big strength against twisting in particular at level of its connection with the connection arm 2. Involving solders with the tube

94 of connection of handles 1, they are strengthened by at least one board of triangular aluminium 90 forming strut. Handles 1 are reunited by a stretchable elastic thread passing inside the tube of connection 94 and tied up in their free extremity behind the opening of a plastic tip making at the same time retaining of the rubber band and shutter of tube of handles to improve the finish. When they are extracted from the tube of connection, they are so retained by this elastic thread, and can be arranged by hanging at the connection arm 2 by means of elastic deformable clips 39 made of synthetic material solidary with the third elastic deformable clip 14 enclosing the connection arm 2, equipped with an ergot taking place in a slit of tightening 102 to prevent its rotation around the tube. The width of the handlebar 8 is 51 cm. The tubes have 22 mm section. Preferably, handles 1 are spaced out so that every hand can come into support in the middle of every thigh, which is useful to obtain acquainted in first braking. The handles 1 are covered with synthetic foam facilitating their prehension and evacuating perspiration. Every handle 1 is equipped with a braking control lever 18 each commanding a braking system 19 through cables 15 passing inside the supports 21 which maintain them against the connection arm 2 by guiding them up to brakes 19. One of the handles 1 is equipped at its extremity of a hook 37 enabling to retain the control lever 18 corresponding to maintain a brake 19 in working position to block the wheel 3 during the parking in support against a prop. As shown in figure 4, the hook 37 is equipped with a recall spring 38 to be released as soon as the control lever 18 is activated. The lower tube is equipped all around at each of its extremities with a 2 cm wide reflectorizing band 16 to reflectorize towards all directions. It also comprises aluminium supports 21 soldered to enable to hang of accessories such as a support 64 of bottle 22. It also comprises a hook 20 fixed by 4 screws 55, enabling to suspend it to a supermarket carriage to keep it with oneself when shopping. It is made of transparent synthetic material for aesthetics reasons. One load-carrier 43 comprising two identical arms appreciably being prolonged until the front aplomb of the wheel 3 is arranged over this one. It is set up cantilever and is solidarized to the device at level of the axis 4 of the wheel 3 by one of its extremities 56 comprising means to prevent its rotation around this fixation point. It comprises two curvatures, which one particularly pronounced to increase the elasticity of its structure. It consists of elastic material, resistant synthetic material or steel, tube or full bar, so that its elasticity depending of its architecture and matter weakens the vibrations and the ground 5 irregularities. The load-carrier arms 43 are each equipped with at least one closed ring 111 circular, elliptic or rectangular with round angles enabling to introduce a hook of elastic luggage or a flat belt there to lash up loads arranged on the load-carrier 43. The total weight of the basic device without accessories is about 3.5 kg.

On figure 2, an aerodynamics fairing 35 is arranged on the device to increase its performances about adherence and drag coefficient. Its previous fixation 36 is centred on the radius of the wheel 3 and solidarized to the device at level of the axis 4 of the wheel 3, so that it can swivel around this axis to make it vary the height behind according to the skater's size without that a position makes it never come into contact with the wheel 3.

On figure 3, the load-carrier 43 is prolonged by kickstands 33 enabling to park the device in an appreciably vertical position forward, its gravity centre passing then ahead the aplomb of the wheel 3 axis 4. These kickstands 33 are constituted by a tube prolonging the load-carrier arms 43. So, the kickstanding takes advantage of the load-carrier 43 elasticity to weaken the shock, if the kickstanding is a little bit rough. The extremity of the load-carrier arms 43 embed inside the tubes of the kickstands 33 where they remain maintained by simple friction or by other means. The tubes of kickstands 33 can embed as well inside the load-carrier arms 43 if they are tubular. The extremity of kickstands 33 is capped and protected by a rubber plug 32.

In this figure, the device also comprises a device to easily jump over kerbs 30. This device includes a smooth board 23 on both faces 25 cm long and 9 cm wide and about 1 cm thickness, made of synthetic material, bent

back at its front and superior extremity, connected to a few centimetres of this superior extremity at the end of at least one superior fixation by a joint 24 in a plan equipped with a recall spring 29. The other extremity of this fixation is connected by a joint 24 in a plan at the end of the load-carrier arms 43 to use the elasticity of this last one, so as to weaken the shocks during the contact with kerbs 30. This superior fixation is itself articulated and works as a compass of boltable opening. It consists of two segments 26 articulated the one with the other in a plan by one of their extremities, the other one being connected by a segment with the jumping board 23, and by the other segment with the load-carrier 43. The joint between them is free of a side in locking position of the compass, but blocked by the other one in bolting position by abutments 25 located in opposite and opposing during the opening in a close position but exceeding the alignment of three articulation points 24. The folding or the closing of the compass is controlled by a control lever located close to a handle 1, independent of control levers 18 of brakes 19 through a cable passing inside a scabbard 31, so that the compass is stiff in bolting position to make operational the jumping device, and so that both segments 26 articulate the one to the other in lock position after unbolting of the compass obtained by a manual pulling on the control lever causing this traction to be transmitted to one of the segments 26, preferably close to its joint 24 with the other one, by separating abutments 25 and until the three joints are not any more aligned in the opposite position to this they had during the bolting, so that the compass closing, the jumping board 23 articulated in its lower point of fixation 24 makes a swivelling in support on the ground 5 according to the device overbalance forwards, until the extremity 32 of the kickstands 33 comes into contact with the ground 5. A spring 29 can place again the compass in bolting position, notably if the very weight of the jumping board 23 is not enough for that, as soon as the device is straighten up backwards by the skater to be used, the jumping device becoming then automatically operational. There is also at least one lower fixation of the jumping board 23. It is stiff, made of metal, full stalk, tube or ribbed board, and it is connected by a joint 24 in a plan with the board 23 whereas the other extremity is fixed in a stiff and fix way at the fixation support of the load-carrier 43, on a paw 109 foreseen for that purpose. This extremity of the lower fixation is equipped with means 120 opposing its swivelling around the screw which subjects it to the paw 109. In the present case, it is about a solidary projection of the lower fixation arranged transversely and coming in support against the thickness of the paw 109. On figures 3 and 8, the scabbard 31 has been revealed, but in fact it passes discreetly in the thickness of the load-carrier 43. The fork arm 7 are equipped on their outside face with thread openings 153 enabling to fix it additional loads accessories notably such as stabilizer, pump or bottle-rack ensuring at the same time their nominal function and a ballasting function having besides interest to increase the adherence and the inertia, that to lower the gravity centre. The thread opening 153 is made of a thick slice 154 which face at contact with the fork arm 7 is concave to conform to it. The slice 154 is soldered on its periphery with the fork arm 7.

In this variant, the brake 19 located ahead the fork 7 is set up closer to the fork arm 7 and lower than the brake 19 located backwards the fork 7. To get this arrangement, the support of the front brake 19, comprising an axis on which the brake 19 swivels, is shorter than the support of the back brake 19 and is solidarized with the fork 7 by soldering at a lower level than the one of the back brake 19.

On figure 4, the tube of the handlebar 8 is drilled by two holes in opposite at a few millimetres of its extremity at diameter of thread of a metallic hook 37 which extremities are bent back the one towards the other and introduced inside openings, so articulating the hook 37 on this transverse axis according to the handle 1 and the brake control lever 18 to the shape which hook 37 is shaped at its lower part. One of extremities of a recall spring 38 is inserted into a small opening made in the handlebar 8 whereas the other one is bent back to the

shape of the thread and acts on a branch of the hook 37 by raising it, which constitutes its rest position. The working position is obtained by pulling the control lever 18 and by overbalancing the hook 37 below by means of auricular. It remains then blocked as the brake in this working position until a new traction on the control lever 18 which will release the hook 37 by the spring 38 action.

On figure 5, a 2 cm wide aluminium support 21 and same length is soldered with the lower tube of the connection arm 2, and guides the scabbards 15 of the brakes 19 control retaining them against the connection arm 2, while presenting a thread opening enabling to fix an accessory by a screw 54, in this case a bottle-rack 53, and by opposing to the rotation of an elastic deformable clip 51 fixed by rivets 65 to an accessory 52, a pannier for example.

On figure 6, an appreciably semicircular shaped hook 20 is fixed at the lower tube of the connection arm 2 by means of two screws 55 at every side to prevent its rotation, and presents a cutting which internal edge is oblique, that opposed to the connection arm 2, so as to tighten against this last one the support 105 to avoid harmful movements and clearance, in this case the superior bar of the front of a metallic supermarket carriage. On figure 7, fixation screws 55 are located in opposite. The hook 20 can be made of metal or synthetic material.

On figure 8, the opening compass is closed and segments 26 are not aligned. The jumping board 23 rests against the ground 5 after having swivelled during the kickstanding around the joint 24 of its lower fixation. During this operation, the wheel 3 came to take place above the lower part of the board 23. Both extremity edges 32 of kickstands 33 are supporting on the ground 5 and the device is in appreciably vertical parking on three support points, only the lower part of the board presenting a resistance to constitute the third support point. The lock of the compass was activated by traction on the control lever having unbolted the compass by raising segments 26 via the cable passing in the scabbard 31. So that the cable applies a simultaneous traction on the segments located at both sides of the load-carrier 43, means are implemented to ensure a simultaneous and equivalent traction on each of both compasses, such a swingle-bar which extremities are connected on the one hand with every compass, and on the other hand at the end of the cable 31 in a not sliding way.

On figure 9, the load-carrier 43 is prolonged forwards by kickstands 33 joined together for a better stiffness by front 58 and back 112 tubes having same section as kickstands 33. The front crossbar 58 can support loads in position of counterweight of the connection arm 2 and handlebar 8, a front headlight 121 notably, ensuring the lighting of the ground 5 in night-trajectory. It is preferentially set up by means of a rubber deformable clip to be directed and adjusted as wished and to be easily removed to replace the piles. This crossbar also serves as support resisting for the compasses unbolting scabbard 31 abutment. The load-carrier arms 43 are independent, but they are assembled by means of thread stalks 47 at their extremities via a device 46 of quick hanging / unhooking of loads. A quick blocking device of loads not conceived to cooperate with the device 46 is articulated on the back crossbar 112 on which it swivels. Means of recall, in this case a spring 117, forces the pressing device 114 constituted by a grid made of synthetic or metallic material which at least a part 116 is deformable, preferably the central part, so as to adapt itself to various or irregular shapes. In rest position, abutments 113 solidary with the pressing device 114 come into support against a part of the load-carrier arms 43, but without jutting out above, so as that the presence of the pressing device 114 in rest position has no harmful effect on the loads arrangement over the load-carrier 43. Due to its opening position, the pressing device 114 opposes to the gliding of loads over the load-carrier 43, either during kickstanding or braking.

In figures 10 and 11, we see that the means to fix the load-carrier 43 consist of a metallic board 56 on which is solidly soldered the beginning of a load-carrier arm 43. Two folds 175 in opposite strictly enclose the extremity

of the fork 7 without any clearance, on both sides its flattened part along about 30 mm length and with 3.5 mm thickness. Folds present an important strength to the deformation. The board 56 is fixed at the fork 7 by means of the nut of the wheel 3 axis 4.

On figures 12 and 13, the board 56 presents moreover adjustment means enabling to make varying the slope of the load-carrier 43. These means are constituted by conical wedges 60 taking place in a space determined between the fold and the flattened edge of the fork extremity 7. The wide extremity of the wedge 60 receives the extremity of one screw 61, and is subjected to screwing or unscrewing of a six hollow sides adjustment screw 61 enabling to advance or to move back the wedge in this space, and so to make the points vary where it takes support against the folds of the board and the flattened part of the fork arm 7.

In figures 14 to 19 are presented the solidarisation means of guide and retaining of loads on the load-carrier 43. A weak thickness metallic or synthetic rectangular board 40, intended to cooperate in this quick solidarisation means, is solidarized by rivets with the load 66. It presents two round stalks 41 square folded up in their extremities solidly fixed with the board 40. The board 40 comprises on its longitudinal edges two incurved sections 42, preferably semicircular, which radius is slightly superior to that of the load-carrier arms 43. These sections 42 are intended to cover the top of the load-carrier arms 43 to distribute the weight of the load 66 on these arms, and to ensure its lateral retaining. The front extremity of these sections is preferentially deeper and more flared to serve as blindly guiding means without requiring to visually position the sections 42 over the load-carrier arms 43. The load-carrier 43 is solidarized in position transversely centred with a section made of synthetic material 46 by four stalks which extremity at least is thread and blocked by screwing in small metallic paws soldered below the load-carrier arms 43, whereas the other one is in openings made in the section 46. This one comprises and retains at least one metallic board 45 comprising cuts forming hooks 70 sized to receive in their opening 71 the round stalks 41. Corresponding to opening 71 of these hooks 70 are transverse notches 48 of the section 46 when the board 45 is armed in waiting position of solidarisation with the load 66. This board 45 is maintained mobile inside the section 46 between sliding guides and abutments limiting the sliding movement of clearance. The board 45 is connected with a preferably powerful traction spring 77 held by its other extremity at the internal and front extremity of the section 46. The back part of the section 46 presents a lengthened light 67 in which axis slides 76 getting through the board 45 near its back extremity. The position of this axis 76 is controlled by a control lever 57 located behind, presenting means of prehension 140 for fingers, and enabling to arm the quick solidarisation. This control lever 57 is set up swivelling on the axis 76 which movement of clearance is limited by the length of the light 67. By pulling back on the extremity of the control lever 57 where its prehension means are, it swivels on the axis and its other extremity takes support against the back extremity of the section 46, which causes the axis to displace backwards, which involves the board 45 to this movement. A small synthetic material board 72 set up swivelling ahead the front hook 70 on an axis 75 is then recalled upwards by a spring 73 until its abutment 74 comes to take place against the lower face of the front hook 70. By releasing the control lever 57, the spring 77 opposes the nose of the front hook 70 against the small board 72 came to position ahead it due to its abutment 74. This small board so maintains the position of the board 45 while openings 71 of hooks 70 are aligned with the transverse notches 48. When the back stalk 41 is presented in the notch 48, it is enough to press on the front stalk 41 automatically positioned face up the front notch 48 and of the small board 72 so that this one is pushed downwards by releasing the spring 77, which pulls forwards the board 45 which hooks 70 make captive stalks 41 then located at the bottom of the notches 48 in the opening 71 of hooks 70. Both stalks 41 being so retained, they cannot escape hooks 70 and the solidarisation is actual and

effective. To release them, it is enough to activate the control lever 57 which pulls the hooks 70 behind while rearming for the next solidarisation.

On figure 20, handles 1 are solidary with a flat handlebar 8. A fluorescent pennant 17 is arranged at the free extremity of a telescopic element 16 accommodated when folded up inside the left handle 1, that is to say at traffic side. On both sides of the fork 7 and in prolongation of the axis 4 of the wheel 3, two tubes 131 extend with streaks 132 and are equipped with retaining means 133 at their free extremity. These abutments 133 oppose to the gliding of roller skates intended to take place on the streaked tubes 131 during making of acrobatics. The other extremity of the tube 131 comprises a joint 135 of the tube 131 with the fork arm 7 in order to fold up it for a lesser bulkiness when not used. To block tubes 131 in use position, they comprise means of bolting 134, for example a pin 134 penetrating horizontally in the fork arm 7.

On figure 22, the child seat 96 is equipped with stiff stabilizers 97 which are solidary with it, each equipped at their extremity of a roulette 98 coming rolling against the ground 5 in case of slope of the wheel 3 beyond a certain level.

The variation device illustrated on figure 23 comprises a reversible electric generator 85 equipped with a pebble 84 presenting a tread 6 covered with a streaked and rubber clutching surface, set up solidary and in the axis of the rotor centred on the radius 83 of the wheel 3, and arranged closed at hand, but without touching it, with a disc 81 solidary with the axis 4 and the rim 10 of the wheel 3 and presenting relief streaks 80 converging towards the axis 4 of the wheel 3 in a peripheral zone of the disc 81 intended to come into contact with the pebble 84. The pebble 84 is maintained in this position by the fixation of the reversible electric generator 85 in two solidary points 82 of a slide sliding in a rail 155 fixed, solidary and centred with one fork arm 7.

The variation is obtained by activating a control lever 18 fixed at the handlebar 8 face up a handle, applying a traction on a cable 15 having at first effect to bring into contact until to a pre-adjustable abutment the tread 6 of the pebble 85 with the disc 81 according to a pressure preset by the position of the abutment, and in a second time by continuing the traction on the control lever 18, to move linearly to some centimetres along the fork arm 7 the body of the reversible generator 85 according to the intensity of the traction applied on the control lever 18, to move it towards the outside edge of the disc 81 while maintaining the pebble 85 axis perpendicular with this edge and centred on the radius 83 of the wheel 3, so as to increase on the one hand the braking power by reduction of the couple of the wheel 3 in compensation of the increase of the electromagnetic resistance of the electric generator 85 producing then a bigger quantity of electric current resulting from the increase of the rotor rotation speed, and on the other hand in propulsion stage to reduce the rotation speed of the wheel 3 by compensation of an increase of the couple.

The recall in their rest position at end of braking or propulsion of the body of the reversible generator 85 towards the axis 4 of the wheel 3 on one hand, and the pebble 84 tread closed with the disc 81 on the other hand, is ensured for each by means of elastic recall, a spring for example.

On figure 24, the fork 7 head has a diameter enabling to embed it in the lower tube of the connection arm 2 which section is round. It presents at least one longitudinal ergot 100 in extra thickness which free extremity is rounded to facilitate its inserting inside a notch 99 corresponding in the lower tube of the connection arm 2 with which it has to cooperate for a connection without any clearance in rotation, even without tightening of a clamping band, while enabling a longitudinal translation. The lower tube of the connection arm 2 is equipped with three slits 102 presenting at bottom a circular cutting 103 to reduce risk of tear of the metal. The section in

water drop shape 101 for example, enables to obtain a connection more simply with these characteristics by its alone geometry.

On figures 25 to 28, the arrows indicate the direction of the forces applied by the skater u.

Figure 25 schematically shows an assistance to go forward by movement of arms b taking support on the wheel 3 by applying a forces couple on handles 1 in the axial plan of the connection arm 2, while maintaining the wheel 3 appreciably perpendicular to the ground 5. As shown in diagram A, when the skater u is propelling on the right skate p for example, his right arm b applies a push forwards in the axis of the connection arm 2, whereas the left arm b applies an equivalent pull in the same axis. This forces couple applied in the axis of the connection arm 2 (diagram B) does not cause the slope of the wheel 3 to be modified, nor its direction. On the other hand, it tends to make the wheel 3 skidding laterally. The wheel 3 adherence thus has here an essential role to prevent its side movement to give a solid support to the arms b of the skater u. This mobile support towards the trajectory t and laterally durable enables the skate p which progresses laterally obliquely in the opposite direction, to make it with much more efficiency and power. This phenomenon is even more appreciable in ascents where the sidelong progression is more laterally made, with a more opened angle regarding to the support, so that it reveals even more effective. Moreover, the height of the body being well in support, it is insensible to imbalances caused in ascents by a very lateral step giving a weak front back support, and amplified by a weak speed reducing inertia, and worsening shocks due to irregularities of the ground 5. This movement essentially uses the adherence with the ground 5 of the wheel 3, but also its gyroscopic effect resulting from its inertia in rotation.

Figure 26 schematically shows an assistance to go forward by front back movements of arms b. At diagram C, the skater u folds up his arms b maintaining the wheel 3 in his trajectory axis t and appreciably perpendicular to the ground 5 as he moves his weight on a skate p directed in the trajectory axis t. Then at diagram D he stretches his arms b in an brusque movement, either until total stretching, or with a lesser amplitude, but in every case by definitely stopping this movement while maintaining on the same skate p likewise directed to offer the slightest resistance to go forward, so as to throw the device forwards in the trajectory axis t with more or less force. Reached at end of the movement running of arms b deployment, the device inertia pulls arms b of the skater u forwards. The wheel 3 adherence also plays a part because it does not have to skid during the brusque impulse, nor during its recall into contact with the ground 5 when it left it by effect of the brusque retaining at end of running, because it then passes on the energy accumulated by its inertia during the impulse in a traction forwards. On diagram E, the skater u folds up again his arms b as he moves his weight the other skate p to renew this propulsion to every step.

When the movements have lesser amplitude, they can be quicker and more numerous, arms b being then less folded up and less stretched. This effect can also be obtained by small series of pumping obtained by simple movements of wrists rotation, procuring traction by lesser inertia, but also with constancy and less fatigue.

This assistance to go forward involves a rather symmetric and regular skating movement. But according to a variant, the step is then asymmetrical: By moving his weight on his leg giving him the best balance, the right one for example, the skater u propels with the skate p while bruskly stretching his arms b and maintaining this position for a long time, his weight being moved at maximum on the back part of the skate p maintained directed in the trajectory axis t to profit as much as possible of the impulse given by the device inertia and the propulsion of the skate p (diagram D). When the speed begins to decrease, he takes support on his other leg, folds up his arms b the time of a short propulsion with his left skate p (diagram E), then repeats the action described above by

propelling again for a long time on his right leg (diagram D). In this particular case specific to the device use, the propulsion of the left skate p is much shorter directed laterally than the one of the right skate p.

Instead of folding arms b "recover" the distance which he traverses by advancing with his skates towards the wheel 3, the skater u can also bruskly pull the wheel 3 towards him. That causes his brusque slowing down, but without his energy dissipates in heat as if he used a braking organ to obtain the same result. He so transfers his kinetic energy in the device inertia which is so loaded with it and he can get it back as soon as he throws it again forwards with his arms B. This transfer of energy, which enables to manage his energy by exploiting in some tenth or hundredth of second is very useful and enables an extreme fluidity and an exceptional manoeuvrability notably to move in a crowd, some hundredth of second delayed time being very often sufficient to seize the opportunity of a passage without being so necessary to brake and without losing the corresponding energy which would have then to be produced again, which would cost time and fatigue. The device procures to be so the most manoeuvrable and fastest ground vehicle which exists in the world to move in a crowd, even compact, the apparent bulkiness of the connection arm 2 getting no hindrance in this matter, on the contrary, so much it is immediately free to turn and foldaway to all directions.

Figure 27 schematically shows an assistance to go forward by movements of arms b giving a movement of scull to the wheel 3. To make it and as shown in diagram G, arms b apply a forces couple on the handles 1 in the axial plan of the connection arm 2, while slightly turning the handlebar 8 in the direct direction so as to direct the wheel 3 to the ground towards the trajectory axis t, while the skater u is in support on the right skate p. The resistance to the side skid being opposed to the forces couple tends then to make the wheel 3 progressing sidelong forwards towards the trajectory axis t, which pulls as much forwards arms b of the skater u. This propulsion also results from the wheel inertia 3, the concentration of weights in its periphery tending when braking to entail the wheel 3 forwards by sloping. When by making this progression the wheel 3 exceeded the trajectory axis t, arms b make the same movements this time in opposite directions, the skater u passing then in support on his left skate p. The same movement of scull giving to the wheel 3 a helical movement can be also made in support on both legs, skates directed in the trajectory axis t and appreciably at the same level, without they make any propellers steps (diagram H). It is particularly interesting when the available way on the ground 5 does not enable to ensure the step of the skater u, between two lines of cars for example. In both cases, this assistance to go forward gives a regular and symmetric movement. This movement of scull essentially uses the adherence and the wheel inertia 3. It is obtained effectively only for a rather pronounced slope of the wheel 3 regarding to the vertical line, this one notably depending on the angle made with the ground by a line passing at the same time by the axis 4 of the wheel 3, and by the axis of the handles 1 which must be lower than approximately 57 °. Over this value, the scull effect is more weakly produced. The scull effect is well obtained for an angle 158 of 43 ° (+ or - 10 °) corresponding to the usual angle of use of the device. However, the more the angle increases, and the more the propulsion of the scull effect decreases whereas on the contrary it increases by reducing this angle. Indeed, the more the angle formed by the connection arm 2 with the ground is weak, the more the distance between the skater u and the wheel 3 is important and the more the rotation of the handlebar 8 is similar to the rotation of a steering wheel car, and is transmitted to the wheel 3 mainly by its slope regarding to the ground and vertical, keeping an orientation preferably close to the trajectory axis t. On the contrary, if the angle formed by the connection arm 2 with the ground is important, the distance between the skater u and the wheel 3 is reduced and the rotation of the handlebar 8 looks more like that obtained on a bicycle, being transmitted to the wheel 3 mainly by its orientation regarding to the trajectory axis t, keeping a slope regarding to

the ground 5 preferably close to vertical. For the same orientation of the handlebar 8, the turning circle is more important in the first case than in the second one, which enables to immediately obtain many possibilities in the driving, simply by combining the orientation of the handlebar 8 with the height of hands, this one modifying appreciably the angle made by the connection arm 2 and the vertical. Also, the whole device - skater constituting in a way a three wheels vehicle, presents an extraordinary manoeuvrability, the direction being ensured by the front axle with arms b or by the back axles with legs or in conjugation of both, which, added to the immediate variation of the play angle (angle made by the connection arm 2 according to the vertical), offers a multitude of combinations, from the turn obtained by the orientation of skates without modifying the orientation of the wheel 3, to on the spot about-turn by swivelling without turning circle, passing by the counter steering of the wheel 3 regarding to skates p forming a durable support enabling even low speed a significant slope of the skater's body, which offers him particular and new sensations near those felt by carved bend ski or surfing on snow.

Figure 28 schematically shows an assistance to go forward by movement combining the movements of figures 25, 26 and 27. While he is supporting and propelling on a skate p, the right one for example, the skater u bruskly stretches his arms b and so throws the device forwards, either in the axis of its trajectory t, but slightly sidelong towards the left (diagram I). Reached at the end of running, he profits of the traction generated by the device inertia and then moving to his left foot to propel with this skate p, he applies by his arms b a forces couple on the handles 1 in the axial plan of the connection arm 2, while turning slightly the handlebar 8 in the retrograde direction to direct the wheel 3 to the ground towards the trajectory axis t (diagram J). Then while maintaining this forces couple, he folds up his arms b and profits at the same time of an effect of semi-scull of the wheel 3 and a propulsion effect by pumping of arms b from the durable support constituted by the side skid resistance of the wheel 3 so sloped towards the ground (diagram K). Reached at the end of propulsion by means of his left skate p, his arms b being then folded up, he moves to his right skate p to propel with this foot and renews with his arms b the action described in diagram I. This movement of assistance to go forward uses in the stage "I" the inertia of the device and the wheel 3, and the wheel 3 adherence, then in the stages J and K the adherence and inertia of the wheel 3. The general movement is asymmetrical, as well concerning the arms b as the legs, and is made on one side or the other of the trajectory axis t, as the skater u wants.

The user can skate as usually, only with legs, in a passive way by limiting to push the device in front of him, as he would do it with the device described in the German patent OF 10043857. The device then constitutes like a stroller a weight to move in front of oneself, which reduces the speed of movement. By skating in a dynamic way as described above in a synchronized movement of arms b and legs, the skater u develops more power than without it, which significantly increases his speed, due to an increased spending of energy, as well in ascent as in descent and flat ground.

Being symmetric or not, the general step made by the user is specific for the use of the device in dynamic way, which makes it a complete sport and leisure, making the whole body working harmoniously, giving possibilities, results, performances and sensations rather different from those resulting from the traditional roller skates practice.

To completely play its part, the wheel 3 must have an important moment of inertia. To reach there, the weight and its diameter have to be increased. But for practical questions, the basic device does not have to reach important dimensions nor weight so as to be easily portable or transportable when the wheel 3 is not put on the ground, in stairs for example. So the wheel 3 must keep a reasonable diameter and to be relatively light favouring its moment of inertia. Besides, the effects cannot be validly obtained for outside diameters lower than

14 cm, and it is necessary to use at least 18 to 20 cm diameter to begin to obtain interesting results. And to reach much better performances notably taking account of rolling constraints, it is recommended to use an outside diameter bordering 40 cm for an adult. To reach an important moment of inertia and for a weight 1.5 Kg for example, the weight must be arranged the most possible towards the periphery of the wheel 3. This result can notably be obtained by using a preferably wide tire and/or with a thick tread, an inner tube, a wide thick and massive rim towards its periphery, less numerous but thick and massive spokes especially towards the periphery, and the weakest and lightest possible hub. The wheel inertia 3 and its gyroscopic effect can be again strengthened by the addition of small weights of ballasting or removable inertia blocks arranged near its periphery or near the tyre. So to procure minimal wheel inertia 3, the distribution of the weights on the device has to be such as the following condition is performed: The weight of the complete wheel 3 must be at least equal to 20 % of the total weight of the basic device devoid of accessories and weights of ballasting 151. But it is really a minimum and the 25 % rate gives more perceptible results. A 30 % rate gives satisfactory results and a 35 % rate gives interesting results. They become very interesting from a 40 % rate, but they improve still appreciably for superior rates of 45 % or even 50 %. Around 55 or 60 %, the results are excellent.
Such characteristics are diametrically opposed with those of classic cycles wheels for which weak moment of inertia is on the contrary searched to improve the accelerations, by the use of numerous but fine and light spokes, a fine hollow and light rim at its periphery and a narrow and light tyre.
Also to increase the wheel 3 adherence, the device has to concentrate its weights closer possible of this one or to move them on the axis 4 of the wheel 3 by counterweight effect.
So to procure a minimal adherence of the wheel 3, the distribution of the weights on the device has to be such as the following condition is performed: The weight of the bottom of the device including the elements which are located there, notably at least one part of the wheel 3 and possibly the supports of loads accessories or weights of ballasting 151, representing the lower third of the total length of the device held vertically with the connection arm 2 completely deployed, must be at least equal to 25 % of the total weight of the device possibly equipped with accessories, with supports of loads or with weights of ballasting 151. But that is really a minimum value, and the 30 % rate seems almost necessary. From a 35 % value, the results are a little better but are needed not less than 40 % so that they are satisfactory. For a 45 % value, the results are enough, but become practically good to 50 % or 55 %. So that they are very good, it is necessary to count a 60 % rate, and in 65 % or 70 %, they are excellent. But the appreciations on these percentages can be affected by the position of the weights regarding to the axis 4 of the wheel 3, as they are arranged ahead or behind it.
On figure 29, stabilizers were arranged along the wheel 3 independently of the child seat 96, so that they are useful to stabilize other loads 66.
As shown in figure 32, they consist of a round tube 162 appreciably square bent at the extremity of the smallest part of which a roulette 163 fixed by a screw 164 is set up, whereas the biggest length is set up swivelling inside a tube 159 fixed by two screws 165 screwed in tapped openings 153 made in supports 154 soldered on the outside face of the fork arm 7. The tube 159 comprises an elongated light 160 on approximately a quarter of the circumference of the tube 159 in which a headless six hollow sides screw (161) screwed and blocked in the tube 162 takes place. This one can so easily swivel on approximately a tour quarter corresponding to the length of the light, and take quickly either a fallback position by being directed to the wheel 3 when not used, or by being directed to the ground 5 for an operational position in which the contact of the roulette 163 with the ground tends to maintain it in this operational position.

On figure 30, a load 66 constituted by a ballast is held by each extremities above the wheel 3 by a steel flexible arm 167 stretching vertically from the axis 4 of the wheel 3 at which it is fixed by a nut tightening the board 56 on which its lower extremity is soldered, without any possibility of swivelling thank to means of blocking 175 enclosing the edges of the flattened extremity of the fork arm 7 as shown on figure 11. By every to and fro movement of the arms b, the weight moves to and fro according to a equal radius to the length of the flexible arms 167 by being absorbed at the end of to and fro running by the spring effect of the flexible arms 167. By effect of expansion of the spring contained in the flexibility of the arm 167, the load 66 is thrown forwards, which applies an additional traction to the arms b of the skater u when it reaches to the front abutment.
According to a variant, the interposition of an abutment or a cable 176 connected from the flexible arm 167 with the thread support 154 enables to improve this traction by neutralizing the amortization of the front end of running produced by the flexibility of the arm 167.
On figure 31, a load 66 is hanged on each side of the wheel 3 either by a flexible arm fixed at the axis 4 of the wheel 3 and working in a similar way in that of figure 30, or by a stiff arm 166 articulated on the axis 4 of the wheel 3, preferably equipped with means of amortizations of end of running constituted by a double spring rolled up around the wheel 3 axis 4 .
These mobile loads are illustrated front on figure 33, in combination with fixed weights of ballasting 151 comprising a thread part screwing at the end of the axis 4 of the wheel 3. According to a variant, they can be fixed in an even quicker way with a bayonet assemblage. Naturally, these weights and loads of ballasting are preferably alone employed. The mobile weights 66 enable quicker propulsion. The fixed weights 151 are particularly interesting for the beginners because they increase the inertia without bounce or expansion effect, and oppose effectively to the important and repeated imbalances specific to beginners.
On figure 34, the load 66 is mobile on slides 168 equipped with amortized ends of running 169 and supported by the axis 4 of the wheel 3 by two stiff arms 170 which rotation around the axis 4 is prevented by a stiff rein 179 fixed by means of screws by an extremity with one of the arms 170 and by the other one with the thread solidary support 154 of the fork arm 7. The obtained effects are similar to those of the load 66 on figure 30, with however the advantage to procure for an equal ballasting weight a rectilinear force of inertia better directed to the direction of the trajectory t.
Figure 36 shows a variant of the invention comprising an axis 4 constituted by two coaxial parts on each of which wheel 3 approximately 50 cm diameter is set up, distant from other one about 70 cm. The coaxial axes 4 are maintained by asymmetrical forks 7 with an arm, outside at these. Both forks shape a bearer lowering regarding to the axis 4 of the wheels 3 the assemblage point with the connection arm 2. This assemblage comprises means of joint around an axis 156 maintained by two parallel wheel-disks 171 equipped with means of boltable adjustment of the connection arm 2 slope coming to take place between the wheel-disks 171, the unbolting of these means of adjustment being preferentially actuated by means of control arranged near at least one handle 1, to reduce the device bulkiness at stop by raising the connection arm 2 appreciably vertically by a single gesture. The plans comprising wheels 3 are arranged in parallel and symmetrically with the plan comprising the connection arm 2. Two slides 172 equipped with means of bolting and control of unbolting on which load 66 can be subjected enabling to move the load 66 to and fro and conversely, to make support at level of handles 1 only a weight from 1 to 1.5 kg approximately useful for a good control of the device. So balanced, the device overbalances backwards in support on the ground 5 by releasing handles 1 and forwards if the connection arm 2 is raised forwards perpendicularly to the slides 172. This configuration of the device according

to the invention enables carrying of heavier and more voluminous loads 66 without necessarily using stabilizers 97.

Naturally, the invention is not limited to the realization ways here described as illustrations and as examples. Elements and means which are described and illustrated to obtain an increase of the device and the wheel inertia, and the wheel adherence could be used independently of a device described in the claim 1 which would not comprise it. So, even if they can be used in other purposes, such means could be adapted to a known device as for example that of the German patent OF 10043857, which would have for effect to confer or to enable conferring at this known device which is at present deprived of them, the essential characteristics of the present invention.

The invention is likely for industrial applications in sport, leisure activities and non-polluting conveyance, as well individual as utilities type.